

## **Historic, archived document**

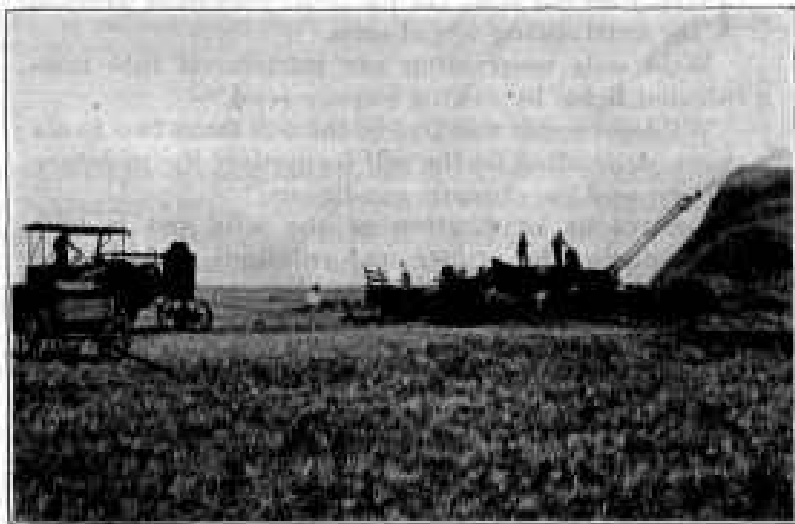
Do not assume content reflects current scientific knowledge, policies, or practices.

LIBRARY  
Bureau of Market  
U. S. DEPARTMENT OF AGRICULTURE

# METHODS OF CONTROLLING OR ERADICATING THE WILD OAT IN THE HARD SPRING- WHEAT AREA

H. R. CATES

Scientific Assistant, Office of Forage-Crop Investigations



FARMERS' BULLETIN 833  
UNITED STATES DEPARTMENT OF AGRICULTURE

Contribution from the Bureau of Plant Industry  
WM. A. TAYLOR, Chief

Washington, D. C.

July, 1917

Show this bulletin to a neighbor. Additional copies may be obtained free from the  
Division of Publications, United States Department of Agriculture

**T**HE wild oat is by far the most prevalent weed in the hard spring-wheat area.

Wild oats most often are introduced into non-infested fields by sowing impure seed.

Wild-oat seeds will live in the soil from two to six years, depending on the soil formation, the moisture supply, and the climatic conditions.

Control or eradication of the wild oat is best accomplished by proper crop rotations and efficient tillage methods, differing according to soil and climatic conditions.

This bulletin explains the general precautions which should be taken under all circumstances. In addition it describes six special methods which have proved effective in controlling or eradicating the wild oat, indicating in each case the subdivision of the hard spring-wheat area in which the method will succeed.

The bulletin applies particularly to North Dakota, South Dakota, and Minnesota, and its recommendations may not suit the conditions of the Pacific Coast States.

# METHODS OF CONTROLLING OR ERADICATING THE WILD OAT IN THE HARD SPRING-WHEAT AREA.

## CONTENTS.

	Page.		Page.
Damage done by the wild oat-----	3	Methods of control or eradication---	11
Description of the wild oat-----	5	Application of the various methods	
How the wild oat is introduced----	6	of control or eradication -----	16
Divisions of the hard spring-wheat		Cooperation necessary in controlling	
area -----	7	weeds-----	16

## DAMAGE DONE BY THE WILD OAT.

**T**HE wild oat is recognized as one of the worst annual weeds found in spring wheat. Unlike cheat, or chess, this weed is found more abundantly in spring grain than in winter grain. It is more widely distributed throughout the hard spring-wheat area (fig. 1) than any other weed and is probably doing more damage. Many farmers whose fields are infested with the wild oat fail to appreciate the loss which it is causing. The land is sufficiently fertile to produce profitable grain crops even when badly infested with weeds. When the weeds are eliminated, however, much more profitable crops are produced.

In this bulletin methods for controlling or eradicating the wild oat which have been practiced successfully and are recommended by farmers and county agricultural agents are set forth. As the conditions and farm practices in different parts of the hard spring-wheat area vary, the methods adapted to one section may not be found suitable elsewhere; therefore methods adapted to the different conditions are recommended in this bulletin, and the conditions under which they are applicable are explained (fig. 2).

Weeds probably are doing more damage and are of more serious consequence to the farmers in the hard spring-wheat area than in any other section of the United States. The records of the Minnesota Grain and Warehouse Commission for the last five years show that the spring wheat inspected by that commission is docked 3 per cent on the average because of weed seeds present, although a large part of this wheat has been screened at local elevators, which removes many of the weed seeds. The spring wheat sold by the farmer is docked considerably more than an average of 3 per cent because of weed seeds present. An examination of 50 or more samples of screenings by Mr. R. C. Miller, of the Office of Grain Standardiza-

tion of the United States Department of Agriculture, showed that wild-oat seeds comprised 50 per cent of the weed seeds found in spring wheat delivered to the elevators by farmers.

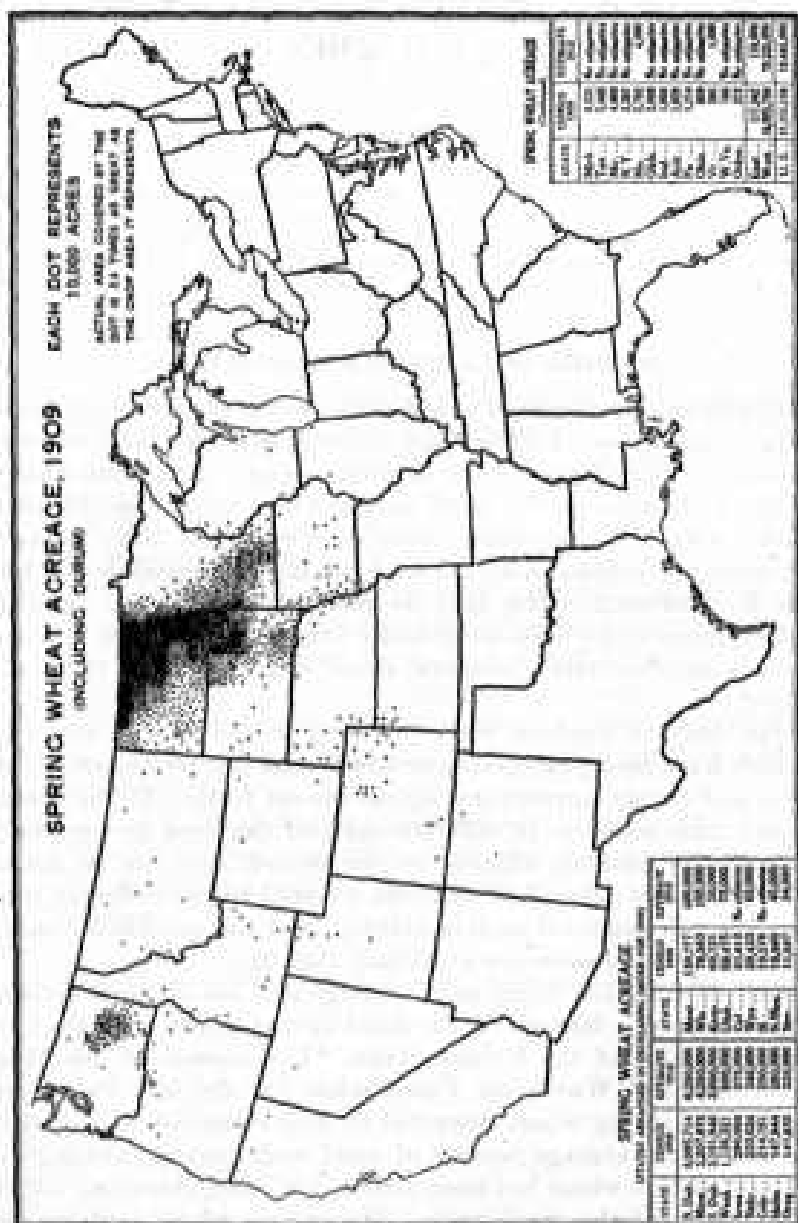


FIG. 1.—Outline map of the United States, showing the area in which spring wheat was grown and the acreage for 1909.

It is difficult to estimate the damage done to the growing crop by the wild oats present. Many fields are so badly infested with this weed that the crop is cut for hay instead of allowing it to mature for grain. The damage to the growing crop by weeds probably is as

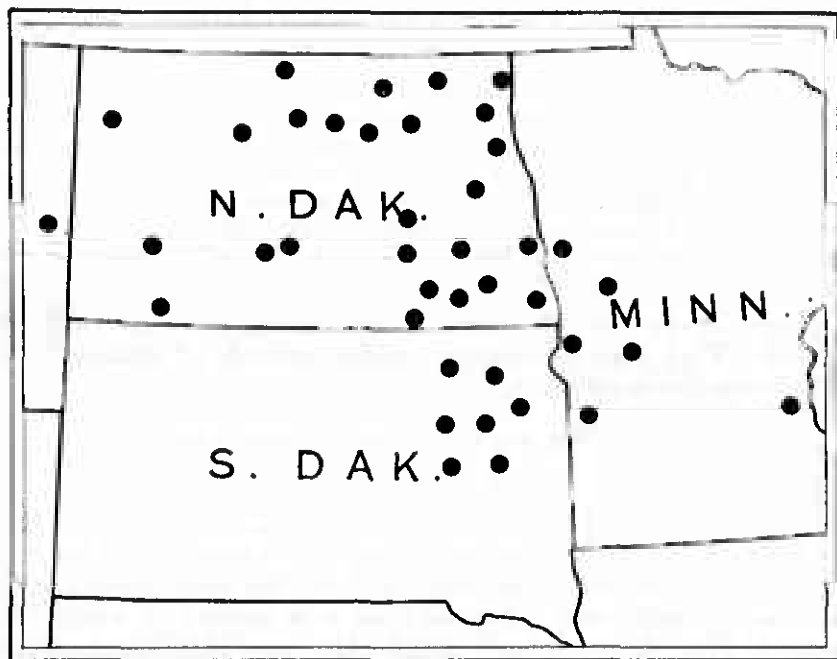


FIG. 2.—Outline map of the hard spring-wheat area (North Dakota, South Dakota, western Minnesota, and a part of the adjoining States). Dots indicate the localities where investigations regarding wild oats were made.

great as the loss from dockage for weed seeds when the grain is marketed (fig. 3). Aside from this dockage, the farmer must pay for hauling the screenings from his farm to the elevators and has no return for this additional expense.

In cultivated crops throughout the western division of the hard spring-wheat area the wild oat is one of the most serious weed pests, and its presence increases the cost of producing a crop which requires intertillage. By robbing the soil of moisture and plant food it lowers the yield of any crop with which it competes. Where intertilled crops are extensively grown, however, this weed soon disappears. On summer fallow the wild oat is a serious pest and considerable additional cultivation is required.

#### DESCRIPTION OF THE WILD OAT.

A number of species of the wild oat (fig. 4) are found in this country. Of these *Avena fatua* is the most troublesome in the hard spring-wheat area. There are several varieties of this species, each having distinct botanical characteristics. In appearance they are very similar to the cultivated oat, but can be distinguished from it by the fact that the wild plants generally grow taller and the large open panicle is paler.

In the hard spring-wheat area two distinct varieties of the wild oat are found:

(1) A black-seeded variety, the kernel of which is dark brown or black. This variety resembles the cultivated black oat, but the kernel is not so plump and the horseshoe-shaped scar at the base is more pronounced. This wild oat has a long, stiff, twisted awn, and the base of the kernel is very hairy.

(2) A white-seeded variety, very similar to the one described above except that the kernel is creamy white, resembling the cultivated white oat. Many intermediate forms, probably hybrids, are found, with varying shades of color, but most often gray. The degree of hairiness varies in all forms.

These varieties are all annual plants, having the same habits of growth. They therefore require similar methods of treatment for their control or eradication.

### HOW THE WILD OAT IS INTRODUCED.

One of the most important precautions to take in the control of weeds is to prevent their introduction on farms or fields where they are not now found. Of the various ways in which the wild oat may be introduced into any community, perhaps the most common is by the use of impure seed. The wild oat is at present so widely distributed throughout the hard spring-wheat area that comparatively little seed wheat which is free from its seeds is available. A few wild-oat seeds will be sufficient to infest a field, and after several years the weed will have gained such headway as to cause serious damage. Extreme care should be exercised to see that clean seed wheat is sown.



FIG. 3.—A field of wheat infested with wild oats, the most widely distributed weed found in the hard spring-wheat area.

In those localities where the grain fields are so badly infested with wild oats that the crop is cut for hay, the hay frequently contains weed seeds which are sufficiently mature to germinate. If the manure obtained from feeding this hay is scattered over the farm there is danger of introducing the wild oat in this manner. Care should be taken to compost such manure a sufficient length of time to destroy all weed seeds.

Weeds should not be allowed to grow and mature seeds along roadsides and in vacant fields and waste places. Prevention is much easier than cure.

Thrashing outfits (see illustration on title-page) often carry many weed seeds when going from one farm to another. Care should always be exercised to see that the outfits are thoroughly cleaned before they are moved.



FIG. 4.—The wild oat.

#### DIVISIONS OF THE HARD SPRING-WHEAT AREA.

The wild oat is distributed over the entire hard spring-wheat area, consisting of North Dakota, South Dakota, western Minnesota, and a small part of the adjoining States. In this area three divisions may be distinguished, in which the climatic and soil conditions differ and different farm practices are employed (fig. 5). In these divisions the prevalence of the wild oat varies and the methods most desirable for its control or eradication differ.

These three divisions are as follows: (1) The Red River Valley division, which includes western Minnesota and eastern North



Dakota; (2) the western division, which consists primarily of western North Dakota; and (3) the southern division, composed largely of eastern South Dakota and southwestern Minnesota.

*Red River Valley division.*—This division is composed of alluvial soils, consisting largely of dark, stiff clay. The country is very flat and generally is rather poorly drained. Because of these conditions, one of the greatest difficulties is the surplus water on the fields in early spring, which retards farm operations. Too much water during the growing season sometimes injures the crop also. When the river overflows the cultivated land, the water acts as a distributor of many weed seeds. Most of the land in this division is under cultivation, and the country is well developed. A general type of agriculture is established and is relatively stable.

The principal crops grown are wheat, oats, barley, rye, flax, timothy and clover hay, corn, and potatoes. During the past few years alfalfa has been receiving more consideration and many farmers are growing it extensively (fig. 6). This crop appears to do well and probably will become important. Corn is grown extensively for forage and ensilage, though little mature grain is produced (fig. 7). Spring wheat is by far the most important crop and receives the greatest attention in the farm operations. It is the first crop seeded in the spring.

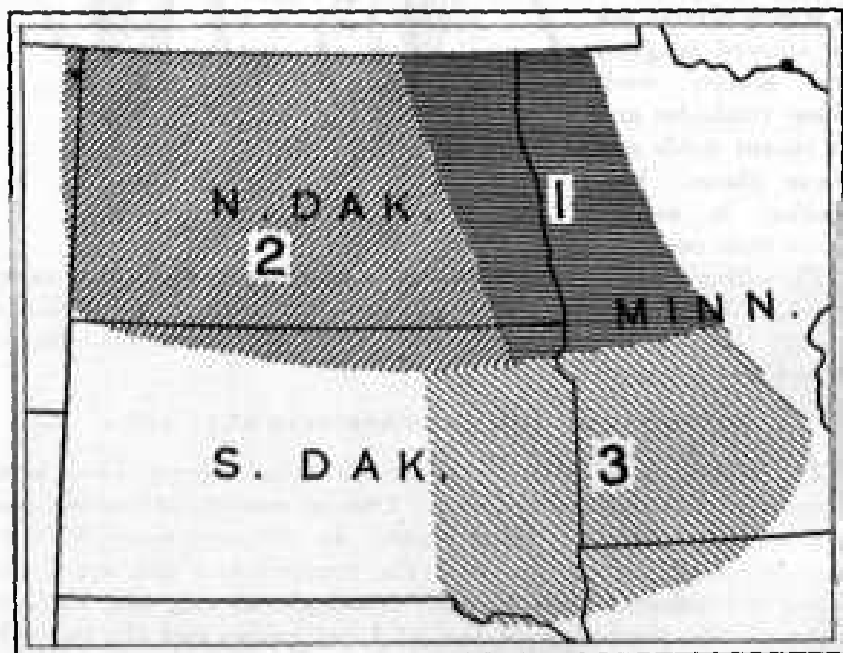


FIG. 5.—Outline map of the hard spring-wheat area (North Dakota, South Dakota, western Minnesota, and a part of the adjoining States), showing the approximate regional divisions.



FIG. 6.—A field of alfalfa in the hard spring-wheat area. This crop is well adapted to conditions throughout this region and should be grown more extensively.

The tillage operations for all the small-grain crops are practically the same. It is customary to plow as much land in the fall as time and the weather conditions permit. About 60 per cent of the land is plowed in the fall and the remainder in the early spring. Just before seeding, the land is harrowed once or twice with a disk or spike-tooth harrow, the latter being more generally used. Heavy teams and large implements are employed. Two men with a sufficient number of horses usually prepare the land and seed 400 to 500 acres of small grain. Much more labor is required, however, for harvesting the crop.

During unfavorable seasons when the weather conditions do not give time for thorough preparation, wheat sometimes is seeded without plowing the land. The old stubble fields are harrowed with a disk harrow and the grain drilled in without further preparation. This process is known as "stubbling in." Under this method weeds are much more abundant.

During the last five years the farmers in this division have been growing more alfalfa, more timothy and clover for hay, and more corn for ensilage. Consequently more cattle and hogs have been kept. Small-grain crops largely predominate and few intertilled crops are grown. Wild oats are exceedingly troublesome throughout this entire area.

*Western division.*—The western division, consisting mainly of western North Dakota, has a more sandy loam soil. The fields are level or gently rolling and the rainfall light. These features afford

good natural drainage and enable wild-oat seeds to remain alive in the soil for a much longer time than in the heavier clay soils.

This is comparatively a newly developed area, with conditions and methods different from the Red River Valley division, which is older and more thoroughly developed. A much larger percentage of the land is in native pasture or prairie-grass meadow. Wheat is the predominant crop. Other crops, in the order of their importance, are oats, barley, flax, rye, corn, and alfalfa. Corn is grown mostly for forage and ensilage. Alfalfa is highly recommended by State officials and by the extension departments of the State agricultural college. Many farmers are growing small patches. This crop appears to be fairly well adapted to local conditions, and no doubt will soon become important. Hay crops are a great advantage in controlling wild oats.

The tillage practices in this area are hardly so thorough as in the older eastern division. When the prairie land is first broken it is seeded to flax, which thrives best on fields comparatively free from weeds. The first year after the prairies are broken few weeds are present. Usually a crop of flax is grown on this new land, and then, without plowing, the stubble field is disked thoroughly and seeded to wheat without further preparation. It is customary in this area, as in the one previously described, to plow as much land in the fall as is practicable and the remainder in the spring. When the seasons are not favorable, however, much wheat is "stubbled in." Under such conditions weeds generally are more abundant and the yields of



FIG. 7.—A field of corn in the hard spring-wheat area. Corn is becoming an important crop for forage and ensilage in this region. (Photograph furnished by the Office of Corn Investigations.)

wheat much smaller than where the land is thoroughly prepared. By far the worst weed throughout this area is the wild oat, which is found in abundance in all crops.

*Southern division.*—This division, which is composed of eastern South Dakota, southwestern Minnesota, and northwestern Iowa, has a greater rainfall, and, being farther south, has a longer growing season than the Red River Valley and western divisions; consequently, a more diversified type of farming is practiced. Practically all the land in this division is under cultivation, and the country generally is well developed and prosperous. About 30 per cent of the tillable land is seeded to wheat. Other crops, in the order of their importance, are oats, barley, corn, timothy and clover, alfalfa, and flax. Because of the longer growing season and heavier rainfall, corn is more extensively grown here than in the other divisions. Alfalfa also is becoming an important crop. A few farmers are growing winter wheat and winter rye with fair success.

The tillage practices with small-grain crops are very similar to those employed in the Red River Valley. Since more diversified farming is practiced, which includes intertilled crops and grass for hay, the land receives more thorough tillage than in other divisions. Because of this diversified system of farming and more thorough tillage practices, weeds are less injurious than in the areas where continuous grain farming is more largely practiced. As is customary throughout the hard spring-wheat area, about 60 per cent of the land is plowed in the fall and the remainder in the spring. Just before seeding, this land is harrowed once or twice with a disk or spike-tooth harrow, preferably the latter, and then seeded without further preparation. Wild oats are found scattered throughout this entire division, but are not so prevalent as in the areas where diversified farming is less common.

#### METHODS OF CONTROL OR ERADICATION.

The principal difficulty in the control or eradication of the wild oat lies in the fact that it matures seeds which shatter off before the small-grain crop infested is sufficiently mature to harvest. Often, however, these seeds do not germinate until the spring after they are produced. Previous investigations indicate that wild-oat seeds may remain in the ground from two to six years before germinating, depending upon soil and climatic conditions. In the stiff clay soils of the Red River Valley, these seeds appear to decay and will not germinate after two years. In the western part of North Dakota, however, where the soil is of a more sandy character and the rainfall lighter, they may remain in the ground from four to six years and still germinate.

While some methods of eradicating the wild oat which will be found effective under one condition may not be practicable under another, a few general precautions should be taken under all circumstances.

(1) Regardless of what methods are employed for eradicating the wild oat, these efforts will be useless unless clean seed is sown. Probably 90 per cent of the annual weeds infesting spring-grain crops have been introduced by sowing unclean seed. At present the wild oat is distributed so generally throughout this area that it is difficult to obtain seed grain free from it. The cheapest, easiest, and most reliable way of obtaining clean seed is to produce it on the home farm. A sufficient acreage should be set aside to produce the seed needed for the next year's crop. Before harvest all weeds should be pulled out of this field. Care must also be taken in harvesting, stacking, and particularly in thrashing, to keep out weed seeds. In most cases this task will not require more than one day's extra work and will assure clean seed.

(2) Where wild oats occur only in small sections of a grain field, the infested areas should be cut for hay and the crop removed while green. If allowed to cure in the field, some of the partially matured oat seeds will shatter off and reseed the soil.

(3) When wild oats are to be cut for hay they should be harvested before the seed is sufficiently mature to germinate. By exercising this precaution there will be no danger of introducing wild oats through the manure.

(4) If wild oats are cut green for hay the land should be plowed immediately. These plants have wonderful recuperative ability and when cut before maturity may send out new shoots and produce seeds late in the fall unless precautions are taken to prevent this by plowing the land or by pasturing.

(5) Screenings should never be fed unless they are first thoroughly ground in order to destroy any weed seeds which might germinate.

(6) Care should be taken at all times to prevent wild oats from maturing seed along roadsides (fig. 8), in waste places, and in vacant fields. A few scattered plants will produce sufficient seed to start the weeds in a field, and when once started, unless kept under control, they will within a comparatively few years be sufficiently distributed to cause serious damage.

(7) A most important precaution is to avoid plowing under wild-oat seeds so deeply that they will not germinate. These seeds will usually germinate through 3 or 4 inches of soil. If placed more deeply they may live from two to six years, depending on soil conditions and moisture, and if plowed up during this period they will still germinate. A much better plan is to plow shallow, which will cause the seeds to germinate near the surface, and after they have germinated the young plants can be killed by cultivation.



FIG. 8.—Roadside weeds, a source of many weed seeds that could be prevented from maturing by mowing.

On farms where the production of live stock and hay crops are important, or where a rotation which includes an intertilled crop is practiced, wild oats seldom are troublesome.

Below are described several special methods which have proved effective in the control or eradication of the wild oat.

*Method No. 1: Summer fallow or pasture.*—Wild oats will germinate readily under normal conditions through 3 or 4 inches of soil. After a grain crop has been harvested, the field should be plowed in the fall 3 inches deep and immediately harrowed down, thus preparing a good seed bed. Only a part of the wild-oat seeds will germinate the same fall, however. In the early spring the field should be harrowed again in order to hasten the germination of the remaining wild-oat seeds. After the wild oats in this shallow seed bed have germinated and the plants are 2 or 3 inches high, the land should be plowed again about 5 inches deep, turning the furrow slice completely over. This will bury the 3 inches of soil in which the wild-oat seeds have germinated and turn up an additional 2 inches, which may contain more wild-oat seeds. The land should be harrowed down again to prepare a good seed bed. Within a week or 10 days a second crop of wild oats will have germinated. This should be plowed under and summer fallow practiced throughout the remainder of the season (fig. 9), or the wild oats may be allowed to grow and the field utilized as summer pasture provided there is sufficient live stock to prevent any of the plants from maturing seed.

This method will be found effective in any part of the area studied, but probably is most applicable to the conditions of the western division.

*Method No. 2: Winter rye.*—The land should be plowed in the fall and seeded to winter rye, using an early-maturing variety. The rye will mature and can be harvested the following spring before the wild-oat seeds are sufficiently mature to germinate. Immediately after the rye is harvested, however, the land should be plowed, in order to prevent the wild oats from maturing seed in the rye stubble late in the summer; or the stubble may be pastured with sheep or cattle, which will answer the same purpose as plowing by preventing the oats from producing seed. Where winter rye is grown, the wild-oat seeds germinate later in the spring, and although the weed does not mature with the rye it is found in large quantities in the stubble. Unless proper precautions are taken a crop of wild oats will be produced in the late summer after the rye is harvested. Winter rye may be grown in any part of the hard spring-wheat area.

*Method No. 3: Meadow.*—Throughout the Red River Valley where heavy soils predominate, wild-oat seeds will not live in the ground more than two years. The common practice for destroying this weed here is to seed the land to some crop for hay, such as alfalfa or timothy and clover, and after two or three years the wild oats will be entirely eradicated. This method will be effective in any area where wild oats are prevalent. In the western division, however, where the soil and climatic conditions are more favorable to the wild oat, the seeds will live in the ground much longer than in the Red



FIG. 9.—A field in summer fallow, an effective method of controlling annual weeds.

River Valley area, and it is necessary to keep the land in a hay crop for a much longer time in order to kill out the wild oats completely. This method is especially adapted to the conditions in the Red River Valley division.

*Method No. 4: Intertilled crops.*—Throughout the southern division, where more intertilled crops are grown, little trouble is experienced in controlling wild oats, and comparatively few of the seeds are found in marketed grain. Wherever rotations which include intertilled crops can be practiced, it is a comparatively simple matter to keep this weed under control. The intertillage hastens the germination of the seeds which are left in the soil, and additional tillage kills the young seedlings. This is perhaps the most effective method of eradicating any annual weed. Where intertilled crops are grown on land infested with wild oats, the rows should be checked and cultivated both ways. In addition, any plants missed by the cultivation should be pulled by hand before they mature seed. This method is now largely practiced in the southern division.

*Method No. 5: Early barley.*—The land should be plowed in the autumn to a depth of 3 inches and a good seed bed prepared by harrowing. Few, if any, of the wild-oat seeds will germinate in the fall. The land should be harrowed again in the early spring in order to promote germination. A week or 10 days after the spring harrowing the wild-oat seeds in this 3 inches of plowed soil will have germinated. After they have germinated, the land should be plowed 5 or 6 inches deep and a good seed bed prepared. Immediately, before any wild-oat seeds have had time to germinate, an early-maturing variety of barley should be seeded. This barley will be ready to harvest before the wild oats have matured seed. Barley not only matures early but has the advantage of producing a very dense growth of foliage, which has a tendency to smother weeds. After the barley is harvested the land should be plowed, in order to prevent the oats from maturing seed in the stubble late in the summer. Instead of plowing this stubble land, it may be pastured with a sufficient number of live stock to keep the oats under control. Barley is extensively grown throughout the area studied.

*Method No. 6: Barley and rye.*<sup>1</sup>—Plow the land shallow (3 inches) in the fall. Early the following spring disk or harrow the land thoroughly, in order to prepare a good seed bed and to promote the germination of the wild-oat seeds in the soil. Immediately seed to barley or oats and harvest this crop for hay while the wild-oat plants are still green. After the hay has been removed, plow the land 5 or 6 inches deep and in August seed to winter rye. The following sum-

<sup>1</sup> This method is recommended by Mr. William A. Peck, county agricultural agent of Ward County, N. Dak. It is now being employed with success by many farmers in that county.



mer, immediately after the rye is harvested, plow the land shallow. Late the next spring, after the volunteer rye and wild oats have come up, replot 5 or 6 inches deep and seed to barley. The barley may be harvested for grain before the wild-oat seeds are sufficiently mature to germinate.

#### APPLICATION OF THE VARIOUS METHODS OF CONTROL OR ERADICATION.

The most important principle in the eradication of wild oats is to cause the seeds in the ground to germinate and then to destroy the seedlings before they mature. When dry weather prevails wild-oat seeds do not germinate readily; therefore, during dry seasons the methods suggested will not be so effective as when rainfall is plentiful.

In the Red River Valley division (fig. 5), where the soil is a heavy clay and moisture is plentiful, it is probable that the most desirable method to use is No. 3. In the southern division, where the growing season and climatic conditions are more favorable for the production of corn, it is likely that method No. 4 will be found most practicable. In this area the seasons are not so severe as in the areas farther north, and winter rye is a more profitable crop. Method No. 2 may also be found effective. In the western division, where the soil is more sandy and the rainfall lighter, it is probable that methods 1 and 5 will be most effective, though methods 2 and 3 may prove to be valuable.

Throughout the divisions described the conditions vary in different localities, and there may be small areas in which methods other than those suggested will be found more efficient. Every farmer must exercise his own judgment regarding the method to be used.

#### COOPERATION NECESSARY IN CONTROLLING WEEDS.

For permanent success in the control of weeds, cooperation among farmers is essential. Regardless of how painstaking the individual farmer may be to keep weeds from maturing seeds on his farm, the results are discouraging unless the weeds are kept down on the adjoining farms also. Abutting lands where weeds are allowed to grow unmolested simply act as breeding places for the production of seeds which reinfest the land each year. Definite measures and policies should be outlined and adopted by every farmers' club and an effort made to arouse sufficient interest to secure the cooperation of all the farmers in the community. Too much emphasis can not be laid on the advantage of community action for the control of weeds.